

DOCUMENT-IDENTIFIER: US 5184286 A

TITLE: Process for manufacturing tantalum capacitors

BSPR:

The tantalum anode is conventionally made by pressing tantalum powder in a die

to form a porous compact. This compact is then sintered in vacuum at temperatures from 1500.degree. to 2000.degree. C. to form a strong yet still

highly porous body. The sintering process must be controlled carefully to develop adequate mechanical strength in the body and yet avoid excessive reduction in porosity which results in an overly dense anode with diminished surface area and reduced capacitance. Similarly, the use of a high surface-area powder can be counterproductive if the powder is too sinterable

causing excessive densification or if it contains traces of undesirable elements such as phosphorus or sulfur that migrate to and collect on the tantalum particle surfaces during the initial sintering process and degrade the

quality of the anodic oxide film. For example, tantalum powder made by the sodium reduction process has the highest surface area to allow greater capacitance, but is less pure. Electron beam refined powder has higher purity

to allow higher working voltages, but has lower surface area resulting in a lower porosity of the sintered tantalum compact and a subsequently lower capacitance in the finished capacitor. These performance trade offs could be

better optimized by a sintering process that concentrates energy at the points

where individual tantalum particles come into contact resulting in good mechanical bonding without excessive densification. The successful initiation

of a microscopic arc or plasma within the pore spaces of the tantalum compact

could improve sintering where the particles contact yielding a better balance of densification versus porosity in the compact and could increase working voltages of the capacitor by cleaning the tantalum particle surfaces and

removing trace elements.